

JAPANESE [JP,10-069387,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE
INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS

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CLAIMS

[Claim(s)]

[Claim 1] In the management method of the download module which a subroutine program is updated [module] by download and performs it. The pin center, large station which is connected to a circuit and has a storage means for program management, The slave station which is connected to said circuit and has the nonvolatile memory for program download and RAM for program executions possesses. The procedure of memorizing beforehand the program which said pin center, large office downloads for a storage means with call former address information for every subroutine, The procedure which downloads the contents of storage of a storage means to the nonvolatile memory which can rewrite a slave station only about the new subroutine which has modification among the programs concerned, The procedure in which said slave station loads a new subroutine to area other than the program storage area under activation by RAM from said nonvolatile memory continuously, Consisting of a procedure which overwrites to the address of RAM based on the calling agency address information which downloaded the start-address information on the loaded new subroutine concerned to said nonvolatile memory to predetermined timing during the program execution of the RAM concerned. The management method of the download module by which it is characterized.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[The technical field to which invention belongs] This invention relates to the approach of performing a program, without downloading a program to the slave station of a remote place from the pin center,large connected to the circuit of downloading a program from a pin center,large to a base station through a circuit like a cellular-phone system, and stopping a service.

[0002]

[Description of the Prior Art] In the base station of a cellular-phone system, a program exists in every functional block (hardware), and each program exists in the nonvolatile memory which can be independently written as a file. In case it is started, these programs are loaded to RAM and performed. Moreover, when each program has modification taking advantage of the advantage connected to the line network, a corresponding program is downloaded through a line network from a pin center,large, and it memorizes to the nonvolatile memory which can be written.

[0003] When performing these new programs, service is interrupted by reset etc. temporarily, a new program is reloaded to RAM from nonvolatile memory, and exchange with the old program is performed. A new program is anew restarted from the beginning after that, and service is resumed.

[0004]

[Problem(s) to be Solved by the Invention] Since it loaded to RAM per functional block when performing a new program, mediation of each functional block had to be restarted and reset had to be applied to the system. In that case, naturally service will stop and trouble may be caused to service.

[0005] Moreover, since download of the new program through a circuit is performed per functional block, when the functional block concerned is large, in proportion to the magnitude, communication link costs and communication link time amount will be taken.

[0006]

[Means for Solving the Problem] In order to solve the technical problem of the above-mentioned conventional technique, the management method of the download module of this invention which a subroutine program is updated [this invention] by download and performs it The pin center,large station which is connected to a circuit and has a storage means for program management, The slave station which is connected to said circuit and has the nonvolatile memory for program download and RAM for program executions possesses. The procedure in which said pin center,large station memorizes the program to download for a storage means with call former address information beforehand at every subroutine (module), The procedure which downloads the contents of storage of a storage means to the nonvolatile memory which can rewrite a slave station only about the new subroutine (new module) which has modification among the programs concerned, The procedure in which said slave station loads a new subroutine (new module) to area other than the program storage area under activation by RAM from said nonvolatile memory continuously, It consists of a procedure which overwrites to the address of RAM based on the calling agency address information which downloaded the start-address information on the loaded new subroutine (new module) concerned to said nonvolatile

memory to predetermined timing during the program execution of the RAM concerned.

[0007]

[Embodiment of the Invention] Hereafter, 1 operation gestalt of this invention is explained. The pin center,large 1 which drawing 1 is a system block Fig. explaining 1 operation gestalt of this invention, and carries out generalization unitary management of the program under employment, the program to update, The circuit 3 for connecting a base station 2, and a pin center,large 1 and a base station 2, and the non-volatilized memory 4 in which the R/W for memorizing the program downloaded in a base station 2 is possible (FLASH), When performing a program in a base station 2, it consists of CPUs6 which perform the program loaded to RAM5 and RAM5 to which a program is loaded.

[0008] Among the following explanation, ** - ** can be performed without stopping service.

Drawing 2 shows the memory map conceptual diagram of RAM5, and shows program-switching Ushiro's image program change before.

[0009] ** A pin center,large 1 subroutine-izes a program finely moderately, and manages a program for every subroutine of the with the call place address information memorized to the calling agency address information of the main program of each subroutine, and its address.

** Download to a base station 2 is performed through a circuit 3 from a pin center,large 1. The part which downloads is made into the contents of storage of only a subroutine with modification, and the nonvolatile memory 4 which can write this subroutine is made to memorize it as a file in that case.

[0010] ** After download, when performing, the file, i.e., the new subroutine, created by **, CPU6 loads the program concerned to area other than the program under activation on RAM5.

[0011] ** CPU6 acquires separately the start-address (call place address) information which acquired the calling agency address information of the loaded new subroutine from nonvolatile memory 4, and loaded the new subroutine to RAM5.

[0012] ** To predetermined timing, CPU6 overwrites the start address of a new subroutine to the calling agency address of RAM5 based on the address information of **. By this, when the start address of a new subroutine was momentarily overwritten by the calling agency address of the main program section which shows the subroutine called from a main program to drawing 2, a call place changes from the old subroutine to new sub-Ching promptly. Therefore, updating and activation of a subroutine (module) program to download can be performed, without stopping program execution.

[0013] Thus, the base station 2 grade of a personal handy phone system and a program are managed in the pin center,large 1. In the system which downloads the program at the time of renewal of a program, memorizes to the rewritable nonvolatile memory 4, develops to RAM5 and performs the updated program from the nonvolatile memory 4 rewritable at the time of program execution By managing the program which a pin center,large 1 updates for every comparatively small subroutine The traffic at the time of download can be pressed down to the minimum, and a change of a subroutine, i.e., modification of a service program, can be made, without suspending service by managing the address information of a subroutine call further.

[0014] Although it is as above, since it is premised on the system which updates a program remotely through a circuit about management of a program, it is necessary to perform management of a program in the pin center,large.

[0015] Moreover, about the variable currently used in common by the old subroutine and the new subroutine about management of a variable, it must manage so that the same address may be used. When using the new variable which is not used by the old subroutine, information, such as initial value, must be acquired separately.

[0016]

[Effect of the Invention]

1. With the conventional technique, since it was downloading for every functional block, when the functional block was large, communication link cost had started in proportion to the magnitude. However, in order that this invention may manage a download program for every small subroutine, as compared with the former, communication link cost becomes small.

[0017] 2. With the conventional technique, when starting the downloaded program after

download, since reset was required, service needed to be suspended. Since this invention was premised on performing momentarily actuation rewritten to the start address of the new subroutine which downloaded the contents of the calling agency address of a subroutine, it became unnecessary however, to have reset and to suspend service by program modification.

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TECHNICAL FIELD

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PRIOR ART

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EFFECT OF THE INVENTION

[Effect of the Invention]

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Since it loaded to RAM per functional block when performing a new program, mediation of each functional block had to be restarted and reset had to be applied to the system. In that case, naturally service will stop and trouble may be caused to service.

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MEANS

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[0008] Among the following explanation, ** - ** can be performed without stopping service. Drawing 2 shows the memory map conceptual diagram of RAM5, and shows the image program change before and after program switching.

[0009] ** A pin center, large 1 subroutine-izes a program finely moderately, and manages a program for every subroutine of the with the call place address information memorized to the calling agency address information of the main program of each subroutine, and its address. ** Download to a base station 2 is performed through a circuit 3 from a pin center, large 1. The part which downloads is made into the contents of storage of only a subroutine with modification, and the nonvolatile memory 4 which can write this subroutine is made to memorize it as a file in that case.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The block diagram explaining 1 operation gestalt of this invention.

[Drawing 2] The memory map conceptual diagram explaining 1 operation gestalt of this invention.

[Description of Notations]

1: Pin center,large

2: Base station

3: Circuit

4: Rewritable nonvolatile memory

5:RAM

6:CPU

[Translation done.]

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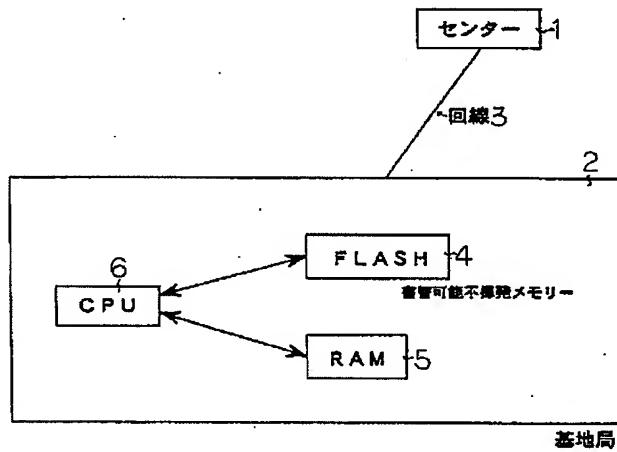
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(54)【発明の名称】 ダウンロードモジュールの管理方法

(57)【要約】

【課題】センターから基地局へダウンロードする際、サービスを一時停止を無くし、ダウンロードの通信費用及び通信時間の削減を図る。

【解決手段】回線に接続されたセンター局と、前記回線に接続されたスレーブ局とが具備され、前記センター局が、ダウンロードするプログラムを予めサブルーチン毎にそのコール元アドレス情報とともに記憶し、変更のある新サブルーチンについてのみ記憶内容をスレーブ局の書き替え可能な不揮発メモリにダウンロードし、つづいて前記スレーブ局が、不揮発メモリからRAMで実行中のプログラム記憶エリア以外のエリアに新サブルーチンをロードし、当該RAMのプログラム実行中に所定のタイミングで当該ロードした新サブルーチンの先頭アドレス情報を前記不揮発メモリにダウンロードしたコール元アドレス情報に基いてRAMのアドレスに上書きする。



【特許請求の範囲】

【請求項1】サブルーチンプログラムをダウンロードにより更新し実行させるダウンロードモジュールの管理方法において、回線に接続されプログラム管理用の記憶手段を有するセンター局と、前記回線に接続されプログラムダウンロード用の不揮発メモリ及びプログラム実行用のRAMとを有するスレーブ局とが具備され、前記センター局が、ダウンロードするプログラムを予めサブルーチン毎にそのコール元アドレス情報とともに記憶手段に記憶する手順と、当該プログラムのうち変更のある新サブルーチンについてのみ記憶手段の記憶内容をスレーブ局の書き替え可能な不揮発メモリにダウンロードする手順と、つづいて前記スレーブ局が、前記不揮発メモリからRAMで実行中のプログラム記憶エリア以外のエリアに新サブルーチンをロードする手順と、当該RAMのプログラム実行中に所定のタイミングで当該ロードした新サブルーチンの先頭アドレス情報を前記不揮発メモリにダウンロードしたコール元アドレス情報に基いてRAMのアドレスに上書きする手順とからなることを特徴とするダウンロードモジュールの管理方法。

【発明の詳細な説明】

【0001】

【発明が属する技術分野】本発明は、携帯電話システムのようにセンターから回線を通して基地局にプログラムをダウンロードするといった、回線に接続されたセンターから遠隔地のスレーブ局にプログラムをダウンロードしサービスを停止することなくプログラムを実行する方法に関する。

【0002】

【従来の技術】携帯電話システムの基地局等では、機能ブロック（ハードウェア）ごとにプログラムが存在し、個々のプログラムが独立にファイルとして読み書き可能な不揮発メモリに存在している。これらのプログラムは、起動される際、RAMにロードされ実行される。また、回線網に接続されている利点を生かして、各プログラムに変更があったとき、対応するプログラムをセンターから回線網を通じてダウンロードし、読み書き可能な不揮発メモリに記憶する。

【0003】これらの新しいプログラムを実行するとき、リセット等によりサービスを一時中断し、新プログラムを不揮発性メモリからRAMにロードしなおして、旧プログラムとの交換が行われる。その後改めて新プログラムが最初から起動しなおされサービスが再開される。

【0004】

【発明が解決しようとする課題】新プログラムを実行するとき、機能ブロック単位でRAMにロードするため、各機能ブロックの調停をとりなおさなければならず、システムにリセットをかけなければならなかった。その際、当然サービスが一時停止することになり、サービス

に支障をきたす場合がある。

【0005】また、回線を通した新プログラムのダウンロードが機能ブロック単位で行われるため、当該機能ブロックが大きい場合、その大きさに比例して通信費用及び通信時間がかかることになる。

【0006】

【課題を解決するための手段】上記従来技術の課題を解決するため、サブルーチンプログラムをダウンロードにより更新し実行させる本発明のダウンロードモジュールの管理方法は、回線に接続されプログラム管理用の記憶手段を有するセンター局と、前記回線に接続されプログラムダウンロード用の不揮発メモリ及びプログラム実行用のRAMとを有するスレーブ局とが具備され、前記センター局が、ダウンロードするプログラムを予めサブルーチン（モジュール）毎にそのコール元アドレス情報とともに記憶手段に記憶する手順と、当該プログラムのうち変更のある新サブルーチン（新モジュール）についてのみ記憶手段の記憶内容をスレーブ局の書き替え可能な不揮発メモリにダウンロードする手順と、つづいて前記スレーブ局が、前記不揮発メモリからRAMで実行中のプログラム記憶エリア以外のエリアに新サブルーチン（新モジュール）をロードする手順と、当該RAMのプログラム実行中に所定のタイミングで当該ロードした新サブルーチン（新モジュール）の先頭アドレス情報を前記不揮発メモリにダウンロードしたコール元アドレス情報に基いてRAMのアドレスに上書きする手順とからなる。

【0007】

【発明の実施の形態】以下、本発明の一実施形態を説明する。図1は本発明の一実施形態を説明するシステムブロック図で、運用中のプログラム、更新するプログラム等を統括一元管理するセンター1と、基地局2と、センター1と基地局2とを接続するための回線3と、基地局2においてダウンロードされるプログラムを記憶するための読み書き可能な不揮発メモリー（FLASH）4と、基地局2においてプログラムを実行するときプログラムがロードされるRAM5と、RAM5にロードされたプログラムを実行するCPU6とから構成される。

【0008】以下の説明のうち、②～⑤はサービスを停止させないで実行することが可能である。図2は、RAM5のメモリマップ概念図を示し、プログラム切替前とプログラム切替後のイメージを示す。

【0009】① センター1は、プログラムを適度に細かくサブルーチン化し、プログラムをそのサブルーチンごとに、各サブルーチンの主プログラムのコール元アドレス情報及びそのアドレスに記憶されるコール先アドレス情報とともに管理する。
 ② センター1から基地局2に対するダウンロードは回線3を通して行われる。その際、ダウンロードを行う部分は、変更のあったサブルーチンのみの記憶内容とし、

このサブルーチンを読み書き可能な不揮発メモリ4にファイルとして記憶させる。

【0010】③ ダウンロード後、②で作成されたファイルすなわち新サブルーチンを実行するとき、CPU6は当該プログラムをRAM5上の、実行中のプログラム以外のエリアにロードする。

【0011】④ CPU6は、ロードした新サブルーチンのコール元アドレス情報を不揮発メモリ4から取得し、またRAM5に新サブルーチンをロードした先頭アドレス（コール先アドレス）情報を別途、取得する。

【0012】⑤ 所定のタイミングで、④のアドレス情報をもとに、CPU6は、RAM5のコール元アドレスに新サブルーチンの先頭アドレスを上書きする。これによって、主プログラムからコールされるサブルーチンは、図2に示す主プログラム部のコール元アドレスには新サブルーチンの先頭アドレスが瞬間に上書きされることにより、速やかに、旧サブルーチンから新サブルーチンにコール先が切り替わる。よって、プログラムの実行を停止することなく、ダウンロードするサブルーチン（モジュール）プログラムの更新と実行が行える。

【0013】このように、簡易型携帯電話システムの基地局2等、プログラムをセンター1で管理し、そのプログラムをプログラム更新時にダウンロードして書き換え可能な不揮発メモリ4に記憶し、プログラム実行時に書き換え可能な不揮発メモリ4からRAM5に展開し、更新したプログラムを実行するシステムにおいて、センター1が更新するプログラムを比較的小さなサブルーチンごとに管理することにより、ダウンロード時の通信量を最小限におさえることができ、さらにサブルーチンコードのアドレス情報を管理することによりサービスを停止することなくサブルーチンの変更すなわちサービスプログラムの変更を行うことができる。

【0014】以上の通りであるが、プログラムの管理については、回線を通して遠隔的にプログラムを更新するシステムを前提としているため、プログラムの管理はセ

ンターで行う必要がある。

【0015】また、変数の管理については、旧サブルーチンと新サブルーチンで共通に使用している変数については、同一のアドレスを使用する様に管理しなければならない。旧サブルーチンで使用していない新しい変数を使用する場合、初期値などの情報は別途取得しなければならない。

【0016】

【発明の効果】

1. 従来技術ではダウンロードを機能ブロックごとに行っていたため、その機能ブロックが大きい場合その大きさに比例して通信コストがかかっていた。しかしながら本発明は小さなサブルーチンごとにダウンロードプログラムを管理するため、従来に比して通信コストが小さくなる。

【0017】2. 従来技術ではダウンロード後、ダウンロードしたプログラムを起動するときリセットが必要であったため、サービスを一時停止する必要があった。しかしながら本発明はサブルーチンのコール元アドレスの内容をダウンロードした新しいサブルーチンの先頭アドレスに書き換える動作を瞬間に行うこと前提としているため、リセットを行う必要がなくプログラム変更によるサービスを停止する必要がなくなった。

【図面の簡単な説明】

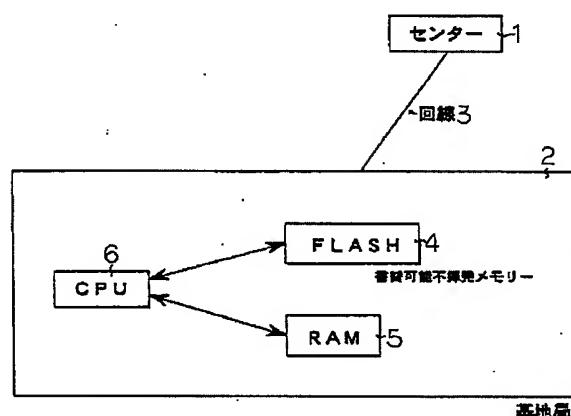
【図1】本発明の一実施形態を説明するブロック図。

【図2】本発明の一実施形態を説明するメモリマップ概念図。

【符号の説明】

- 1 : センター
- 2 : 基地局
- 3 : 回線
- 4 : 書き替え可能な不揮発メモリ
- 5 : RAM
- 6 : CPU

【図1】



【図2】

